

Application No.: 09/974,582

Docket No.: JCLA7521

REMARKS**Present Status of the Application**

The Office Action objected to claims 9 and 15. In addition, the Office Action rejected all presently-pending claims 1-22 under 35 U.S.C. 102, as being anticipated by Arleo et al. (U.S.-5,176,790). Applicants have amended claims 1-18 to improve clarity. After entry of the foregoing amendments, claims 1-22 remain pending in the present application, and reconsideration of those claims is respectfully requested.

Summary of Applicant's Invention

The Applicant's invention is directed to an etching process. The etching process is performed on a silicon layer using a plasma etching gas comprising a fluoro-alkane gas and a nitrogen gas, wherein the fluoro-alkane gas includes fully fluoro-substituted alkane gases and/or partially fluoro-sustituted alkane gases.

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Discussion of objections

According to the Office Action, the disclosure is objected to because the descriptions of etching rates on pages 6 and 7 are lacking units of measure and the etching uniformity parameter disclosed on page 7 is inadequately described.

In response thereto, the unit of the etching rate is angstrom per minute, and applicant have added the unit of the etching rate into the paragraph starting at page 3, line 11. The definition of the etching uniformity is known by one skilled in the art as follows:

$$\text{Etching Uniformity} = \text{ER}_L - \text{ER}_S / \text{ER}_{\text{Avg}}$$

wherein ER_L means the largest etching rate in the selected places on a wafer; ER_S means the smallest etching rate in the selected places on the wafer; and ER_{Avg} means the average etching rate in the selected places on the wafer. When the difference between ER_L and ER_S is smaller, the value of the etching uniformity is smaller. Therefore, the smaller the value of the etching uniformity is, the better the etching uniformity is.

Applicants have added the unit of the etching rate into the disclosure and described the definition of the etching uniformity. Withdrawal of the objection is courteously requested.

Claims 9 and 15 is objected to under 35 U.S.C. 112 because there is insufficient antecedent basis for this limitation in the claim.

Applicants have corrected claims 9 and 15. The amended claims 9 and 15 as follows:

Claim 9 (Currently amended) The ~~plasma-etching gas-etching process~~ of claim 4, 6, wherein the partially fluoro-substituted alkane gas is selected from a group consisting of CH_3F , CHF_3 and CH_2F_2 .

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Claim 15 (Currently amended) The ~~plasma etching gas etching process~~ of claim 6 10, wherein a ratio of CHF_3 to CF_4 is about 3/1 to about 15/1.

The limitations "the partially fluoro-substituted alkane gas" recited in claim 9 and "a ratio of CHF_3 to CF_4 " recited in claim 9 have sufficient antecedent basis for these limitations in the claims. With the entry of these amendments, Applicants respectfully submit that claims 9 and 15 is in compliance with the requirements of 35 U.S.C. 112. Withdrawal of the rejection is courteously requested.

Discussion of Office Action Rejections

The Office Action rejected claims 1-22 under 35 U.S.C. 102, as being anticipated by Arleo et al. (U.S.-5,176,790).

Applicants respectfully traverse the rejections for at least the reasons set forth below.

Applicants respectfully assert that Arleo et al is legally deficient for the purpose of rendering claims 1, 6 and 18 unpatentable for at least the reason that not every element of the claim was taught or suggested by cited references such that the invention as a whole would have been obvious to one of ordinary skill in the art. The present invention specifically teaches "etching the silicon layer using a plasma etching gas" as taught in claims 1 and 6 or "etching the mask layer, the oxide layer and the silicon substrate exposed by the opening using a plasma etching gas" as taught in claim 18.

The technical significant of the foregoing limitations is that the etching object of claims 1 and 6 is a silicon layer. The etching object of claim 18 is a mask layer, an oxide layer and a

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silicon layer. Since the etching gas for etching silicon layer comprises a fluoro-alkane gas and a nitrogen gas, the etching uniformity is improved. On the other hand, Arleo et al teaches etching the insulation material by using a combining of a controlled amount of one or more nitrogen-containing gases and one or more fluorine-containing etching gas (col. 2, line 47-62). The insulation material of Arleo et al comprises a deposited silicon oxide, such as, for example, a silicon oxide, a doped silicon oxide, silicon nitride compound or silicon oxynitride compound (col. 2, line 63-68, col. 3, line 1-6). That is, the etching object of the Arleo et al is an insulation material layer, rather than a silicon layer. Furthermore, Arleo et al does not teach the etching gas including nitrogen-containing gases and one or more fluorine-containing etching gas can be used for etching the silicon layer. Therefore, Arleo et al fails to teach or disclose the claimed invention. Further, Arleo et al lacks any suggestion that the reference should be modified in a manner required to meet the claims.

Applicants therefore respectfully submit that Arleo et al does not render the present invention of claims 1, 6 and 18 unpatentable. Applicants respectfully request that the Office withdraw of the rejection of claims 1, 6 and 18.

For at least the foregoing reasons, Applicant respectfully submits that independent claims 1, 6 and 18 patently define over the prior art references, and should be allowed. For at least the same reasons, dependent claims 2-5, 7-17, 19 and 20 patently define over the prior art as well.

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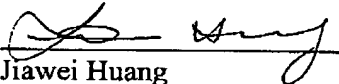
CONCLUSION

For at least the foregoing reasons, it is believed that the pending claims 1-22 are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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